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Generation IV Nuclear Energy Systems

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Generation IV Technology Roadmap

- **Final draft completed 30 September 2002**
- **Identifies systems deployable by 2030 or earlier**
- **Specifies six candidate systems that offer significant advances towards:**
  - Sustainability
  - Economics
  - Safety and reliability
  - Proliferation resistance and physical protection
- **Summarizes R&D activities and priorities for the systems**
- **Lays the foundation for Generation IV R&D program plans**
- **Posted at** http://www.ne.doe.gov/nerac/reports1.html

The Technical Roadmap Report

- Discusses the benefits, goals and challenges, and the importance of the fuel cycle
- Describes evaluation and selection process
- Introduces the six Generation IV systems chosen by the Generation IV International Forum
- Surveys system-specific R&D needs for all six systems
- Collects crosscutting R&D needs
- Recognizes the need for and likelihood of nearer-term deployment, but specifies complete R&D activities

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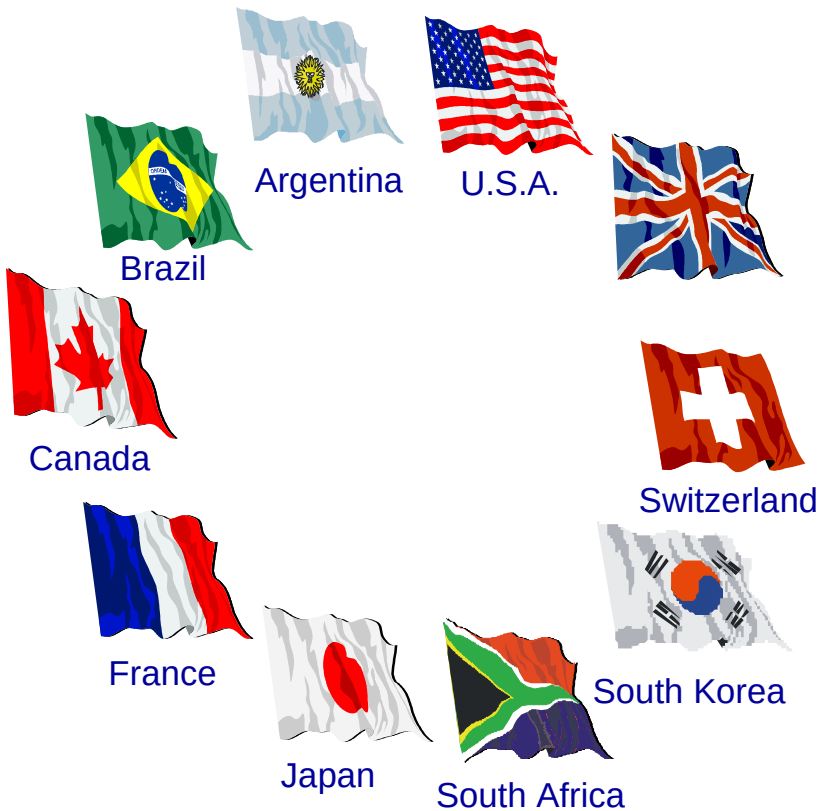
- GIF countries will choose the systems they will work on
- Programs and projects will be founded on the R&D surveyed in the roadmap

Generation IV International Forum (GIF)

Chartered July, 2001



- **International perspective**
  - Generation IV technology goals
  - Active GIF experts participation
  - Observers
    - International Atomic Energy Agency
    - OECD Nuclear Energy Agency
- **Endorsement of key elements**
  - Six Gen IV systems announced September 2002 in Tokyo
  - Generation IV Roadmap issued
- **Generation IV R&D collaboration**
  - National programs based on Roadmap
  - Actively forming collaboration teams

Generation IV Systems

Gas-cooled Fast Reactor	GFR
Lead-cooled Fast Reactor	LFR
Molten Salt Reactor	MSR
Sodium-cooled Fast Reactor	SFR
Supercritical Water-cooled Reactor	SCWR
Very-High-Temperature Reactor	VHTR

- Each system has R&D challenges ahead – none are certain of success

Generation IV System 'Portfolio'

Products

Electricity Production	Both	Hydrogen Production
– SCWR	– GFR	– VHTR
– SFR	– LFR	
	– MSR	

500°C ——— Outlet Temperature ———► 1000°C

Plant Sizes

Large Monolithic	Mid-size	Small Modular
– LFR*	– GFR	– LFR*
– MSR	– VHTR	
– SFR*	– SFR*	
– SCWR		

* Range of options

Fuel Cycles

Once-Through Fuel Cycle	Either	Actinide Management
– VHTR	– SCWR	– GFR
		– LFR
		– MSR
		– SFR

The Roadmap Addresses Viability and Performance R&D Phases

- **Viability**
  - Key feasibility and proof-of-principle decisions
- **Performance**
  - Engineering-scale development and optimization to desired levels of performance

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- **Demonstration**
  - Mid- to large-scale system demonstration
- **Commercialization**

Generation IV Initiative Update

- Submit Roadmap to Congress in Mar 2003
- Submit U.S. Implementation Plan to Congress in Mar 2003
  - Primary focus on VHTR
  - Secondary focus on SCWR and GFR
  - Small metal-cooled system
  - Nominal support of other concepts
  - Further development of concept evaluation methods
- Collaborative team building in progress
- Collaborative agreements in progress

Summary

- Six systems were selected based on evaluations to the Generation IV goals and other considerations
- R&D activities were developed and prioritized with proposed schedules and costs
- Viability phase R&D focuses on key decision points to decide feasibility and proof-of-principle
- Performance phase R&D focuses on priority issues for the system to attract demonstration and deployment
- GIF countries are choosing which systems to pursue and are preparing for collaborative efforts
- U.S. preparing Gen IV program plan based on Roadmap and national interests

The End

Organization of the Roadmap Project

- Technical Working Groups (horizontal)
- Crosscut Groups (vertical)